



SEQUENCE LISTING

<110> Dunn-Coleman, Nigel
Langdon, Timothy
Morse, Phillip

<120> Manipulation of the Phenolic Acid
Content and Digestibility of Plant Cell Walls by Targeted
Expression of Genes Encoding Cell Wall Degrading Enzymes

<130> GC648-2

<140> US 09/991,209

<141> 2001-11-16

<150> US 60/249,608

<151> 2000-11-17

<160> 97

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 2436

<212> DNA

<213> Aspergillus niger

<400> 1

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| gcgtcggaca | tacttcgggg | aatctacggc | ggaatatcaa | agtcttcgga | atatccatat | 120 |
| tgggaaagga | cagaagctcc | ggggtagttt | gtagatgag | ctccggtgta | ttaaatecggg | 180 |
| agctgacagg | agtgagcgtc | atgtagacca | tctagtaatg | tcagtcgcgc | gcaatttcgc | 240 |
| acatgaaaca | agttgatattc | gggaccccat | tgttacatct | ctcggctaca | gctcgagatg | 300 |
| tgcttgccga | gtatacttag | aagccatgcc | agcgtgttgt | tatacgacca | aaagtcaggg | 360 |
| aatatgaaac | gategtcgga | tattttcttgt | ttttatccta | aattagtctt | ccagtggttt | 420 |
| atttaagaga | tagatccctt | cacaaacact | catccaacgg | acttctcata | ccactcattg | 480 |
| acataatttc | aaacagctcc | aggcgatttt | agttcaacat | gaagcaattc | tccgccaaac | 540 |
| acgtcctcgc | agttgtggtg | actgcagggc | acgccttagc | agcctctacg | caaggcatct | 600 |
| ccgaagacct | ctacagccgt | ttagtcgaaa | tggccactat | ctcccaagct | gcctacgccg | 660 |
| acctgtgcaa | cattccgctc | actattatca | agggagagaa | aatttacaat | tctcaaaactg | 720 |
| acattaacgg | atggatcctc | cgcgacgaca | gcagcaaaga | aataatcacc | gtcttcctgt | 780 |
| gcactggtag | tgatacgaat | ctacaactcg | atactaacta | cacctcacg | ccttttcgaca | 840 |
| ccctaccaca | atgcaacggt | tgtgaagtac | acggtggata | ttatattgga | tgggtctccg | 900 |
| tccaggacca | agtcgagtcg | cttgtcaaac | agcagggttag | ccagtatccg | gactatgcgc | 960 |
| tgactgtgac | gggccacagg | tatgccctcg | tgattttctt | caattaagtg | tataatactc | 1020 |
| actaactcta | cgatagtctc | ggagcgtccc | tggcagcaat | cactgccgcc | cagctgtctg | 1080 |
| cgacatacga | caacatccgc | ctgtacacct | tgggcgaacc | gcgcagcggc | aatcaggcct | 1140 |
| tcgcgtcgta | catgaacgat | gccttccaag | cctcgagccc | agatacgacg | cagtatttcc | 1200 |
| gggtcactca | tgccaacgac | ggcatcccaa | acctgcccc | ggtggagcag | gggtacgcc | 1260 |
| atggcgggtg | agagtactgg | agcgttgatc | cttacagcgc | ccagaacaca | tttgtctgca | 1320 |
| ctggggatga | agtgcagtcg | tgtgaggccc | agggcggaca | gggtgtgaat | aatgcgcaca | 1380 |
| cgacttattt | tgggatgacg | agcggagcct | gtacatgggtg | atcagtcatt | tcagcctccc | 1440 |
| cgagtgtacc | aggaaagatg | gatgtcctgg | agagggcatg | catgtacgta | tacccgaagc | 1500 |
| acactttttc | ggtaaatcag | gacatgtaat | aagttccttc | catgaataga | tatggttacc | 1560 |
| ctcaccataa | gccttgaggt | tgcttttctc | ttttgattgt | gaatatatat | ttaaagtaga | 1620 |
| tgacagatat | ctctaaacac | cttatccgct | taaaccctac | atagattgtg | tcacgtgata | 1680 |
| gaccccttga | atgatgagcg | aaatgtatca | gtcccgttta | aatcaaacc | tttcagccta | 1740 |
| gcacagtcag | aatacaccaa | ccccattcta | aggtagtact | aaatatgaat | acagcctaaa | 1800 |

| | | | | | | |
|-------------|------------|------------|-------------|-------------|-------------|------|
| tgcatcgcta | tatgatccca | taaagaagca | acaacctttc | agatctcggt | ttgcgctgcg | 1860 |
| aagagctagc | tctaccatgg | tctcaattat | gagtggagcg | tttagtctcg | tttaagccta | 1920 |
| gctatcttat | aaggacaaca | catgtacatg | ggcttacttg | tagagaggta | ggatcccggg | 1980 |
| cttcttcaca | tctcgaggag | ttgtctacac | gtcgcgtcca | tgtcataagc | cgggtactcga | 2040 |
| cgttgctcgtg | accgtgaccc | agaccctgtg | tgatagcggt | gagaaggccc | tatatattgaa | 2100 |
| tttccaatct | cagctttacg | aagatatgcc | catgggtggag | ggttagtata | ccgatgatga | 2160 |
| tcgtgtgcag | catgagatga | gaccgtggcc | aatcctgttc | aaatgccaaag | acccgcctcc | 2220 |
| taccacatgt | aaggcatccg | tcggccgcac | gttgaattgt | gcaaatgccg | agatcataaa | 2280 |
| agcggccaca | cttcacgctc | ggtactggat | gggttgccgc | tgccataact | gtgttttcca | 2340 |
| ttgcgtgggt | cgttcgtgtt | actgcgacgc | agattctgta | ggcaaggcgc | agggtctctct | 2400 |
| tctgaggtag | aaaacacccc | atattaatct | gaattc | | | 2436 |

<210> 2
 <211> 281
 <212> PRT
 <213> Aspergillus niger

<400> 2

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| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Gly | His | Ala | Leu | Ala | Ala | Ser | Thr | Gln | Gly | Ile | Ser | Glu | Asp | Leu | Tyr |
| | | 20 | | | | | | 25 | | | | | 30 | | |
| Ser | Arg | Leu | Val | Glu | Met | Ala | Thr | Ile | Ser | Gln | Ala | Ala | Tyr | Ala | Asp |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Leu | Cys | Asn | Ile | Pro | Ser | Thr | Ile | Ile | Lys | Gly | Glu | Lys | Ile | Tyr | Asn |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Ser | Gln | Thr | Asp | Ile | Asn | Gly | Trp | Ile | Leu | Arg | Asp | Asp | Ser | Ser | Lys |
| 65 | | | | | 70 | | | | 75 | | | | | | 80 |
| Glu | Ile | Ile | Thr | Val | Phe | Arg | Gly | Thr | Gly | Ser | Asp | Thr | Asn | Leu | Gln |
| | | | 85 | | | | | | 90 | | | | | 95 | |
| Leu | Asp | Thr | Asn | Tyr | Thr | Leu | Thr | Pro | Phe | Asp | Thr | Leu | Pro | Gln | Cys |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Asn | Gly | Cys | Glu | Val | His | Gly | Gly | Tyr | Tyr | Ile | Gly | Trp | Val | Ser | Val |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Gln | Asp | Gln | Val | Glu | Ser | Leu | Val | Lys | Gln | Gln | Val | Ser | Gln | Tyr | Pro |
| | | 130 | | | | 135 | | | | | 140 | | | | |
| Asp | Tyr | Ala | Leu | Thr | Val | Thr | Gly | His | Ser | Leu | Gly | Ala | Ser | Leu | Ala |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Ala | Leu | Thr | Ala | Ala | Gln | Leu | Ser | Ala | Thr | Tyr | Asp | Asn | Ile | Arg | Leu |
| | | | 165 | | | | | | 170 | | | | | 175 | |
| Tyr | Thr | Phe | Gly | Glu | Pro | Arg | Ser | Gly | Asn | Gln | Ala | Phe | Ala | Ser | Tyr |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Met | Asn | Asp | Ala | Phe | Gln | Ala | Ser | Ser | Pro | Asp | Thr | Thr | Gln | Tyr | Phe |
| | 195 | | | | | | 200 | | | | | | 205 | | |
| Arg | Val | Thr | His | Ala | Asn | Asp | Gly | Ile | Pro | Asn | Leu | Pro | Pro | Val | Glu |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Gln | Gly | Tyr | Ala | His | Gly | Gly | Val | Glu | Tyr | Trp | Ser | Val | Asp | Pro | Tyr |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Ser | Ala | Gln | Asn | Thr | Phe | Val | Cys | Thr | Gly | Asp | Glu | Val | Gln | Cys | Cys |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Glu | Ala | Gln | Gly | Gly | Gln | Gly | Val | Asn | Asn | Ala | His | Thr | Thr | Tyr | Phe |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Gly | Met | Thr | Ser | Gly | Ala | Cys | Thr | Trp | | | | | | | |
| | | 275 | | | | | 280 | | | | | | | | |

<210> 3
 <211> 40
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> funcional PCR product reading frame

<400> 3
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<210> 4
 <211> 35
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> inactivated PCR product reading frame

<400> 4
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<210> 5
 <211> 10
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> retention sequence

<400> 5
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<210> 6
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> retention sequence encoding sequence

<400> 6
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<210> 7
 <211> 15
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> FAE-linker-frameshift sequence

<400> 7
 Gly Ala Cys Thr Trp Pro Val Ala Ala Ala Glu Thr Thr Glu Gly
 1 5 10 15

<210> 8
 <211> 48
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> FAE-linker-frameshift sequence

<400> 8
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<210> 9
<211> 41
<212> PRT
<213> Hordeum sp.

<400> 9
Met Ala His Ala Arg Val Leu Leu Leu Ala Leu Ala Val Leu Ala Thr
1 5 10 15
Ala Ala Val Ala Val Ala Ser Ser Ser Ser Phe Ala Asp Ser Asn Pro
20 25 30
Ile Arg Pro Val Thr Asp Arg Ala Ala
35 40

<210> 10
<211> 134
<212> DNA
<213> Hordeum sp.

<400> 10
aagcttacca tggcccacgc ccgcgtcttc ctcttggegc tgcgcgtgct ggccacggcc 60
gccgtgcgcg tgcctctctc ctctctcttc gccgactcca acccgatccg gcccgtcacc 120
gaccgcgcgc ccgc 134

<210> 11
<211> 46
<212> PRT
<213> Rattus sp.

<400> 11
Met Ile His Thr Asn Leu Lys Lys Lys Phe Ser Leu Phe Ile Leu Val
1 5 10 15
Phe Leu Leu Phe Ala Val Ile Cys Val Trp Lys Lys Gly Ser Asp Tyr
20 25 30
Glu Ala Leu Thr Leu Gln Ala Lys Glu Phe Gln Met Ala Ala
35 40 45

<210> 12
<211> 149
<212> DNA
<213> Rattus sp.

<400> 12
aagcttacca tgatccacac caacctcaaa aagaagttct cctctttcat cctcgtcttc 60
ctctctcttcg ccgtgatctg cgtgtggaag aagggtccg actacgaggc ctcaccctc 120
caagccaagg agttccaaat ggcggccgc 149

<210> 13
<211> 50
<212> PRT
<213> Solanum sp.

<220>
<221> VARIANT
<222> (1)...(50)
<223> Xaa = Any Amino Acid

<400> 13

Met Xaa Val His Lys Glu Val Asn Phe Val Ala Tyr Leu Leu Ile Val
 1 5 10 15
 Leu Gly Leu Leu Leu Val Ser Ala Met Glu His Val Asp Ala Lys
 20 25 30
 Ala Cys Thr Xaa Glu Cys Gly Asn Leu Gly Phe Gly Ile Cys Pro Ala
 35 40 45
 Ala Ala
 50

<210> 14
 <211> 159
 <212> DNA
 <213> Solanum sp.

<400> 14
 aagcttacma tggmcgtgca caaggaggtg aacttcgtsg cctacctcct gatcgtsctc 60
 ggccctcctct tgctcgtstc cgccatggag cacttgagcg ccaaggcctg caccckcgag 120
 tgcggcaacc tcggcttcgg catctgcccc ggcggccgc 159

<210> 15
 <211> 5338
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> pTP10-1 vector

<400> 15
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 gccgtgcgcg tcgcctcctc ctctccttc gccgactcca acccgatccg gcccgtcacc 120
 gaccgcgcgc ccgcctccac gcagggcac tcgcgaagacc tctacagccg tttagtcgaa 180
 atggccacta tctcccaagc tgccacgcgc gacctgtgca acattccgtc gactattatc 240
 aaggagagaga aaatttacaa ttctcaaact gacattaacg gatggatcct ccgcgacgac 300
 agcagcaaaag aaataatcac cgtcttccgt ggcactggta gtgatacgaa tctacaactc 360
 gatactgact acaccctcac gcctttcgac accctaccac aatgcaacgg ttgtgaagta 420
 caccgttgat attatattgg atgggtctcc gtccaggacc aagtcgagtc gcttgtcaaa 480
 cagcaggta gccagtatcc ggactacgcg ctgaccgtga ccggccackc cctcggcgcc 540
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 accctcggcg aaccgcgcag cggcaatcac gccttcgcgt cgtacatgaa cgatgccttc 660
 caagcctcga gccagatac gacgcagtat ttccgggtca ctcatgccaa cgacggcatc 720
 ccaaacctgc ccccggtgga gcagggttac gcccatggcg gtgtagagta ctggagcggt 780
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 gcccaggcgc gacagggtgt gaataatgcg cacacgactt attttgggat gacgagcggc 900
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 gattttgccc atttcggcct attgggttaa aaatgagctg atttaacaaa aatttaacgc 1860
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$$\begin{array}{ll} \langle 210 \rangle & 16 \\ \langle 211 \rangle & 311 \end{array}$$

<212> PRT
 <213> Artificial Sequence

<220>
 <223> pTP10-1 vector

<221> VARIANT
 <222> (1)...(311)
 <223> Xaa = Any Amino Acid

<400> 16
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 20 25 30
 Ile Arg Pro Val Thr Asp Arg Ala Ala Ser Thr Gln Gly Ile Ser
 35 40 45
 Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala
 50 55 60
 Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
 65 70 75 80
 Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
 85 90 95
 Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
 100 105 110
 Thr Asn Leu Gln Leu Asp Thr Asp Tyr Thr Leu Thr Pro Phe Asp Thr
 115 120 125
 Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
 130 135 140
 Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
 145 150 155 160
 Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
 165 170 175
 Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
 180 185 190
 Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
 195 200 205
 Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr
 210 215 220
 Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu
 225 230 235 240
 Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
 245 250 255
 Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu
 260 265 270
 Val Gln Cys Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asn Ala His
 275 280 285
 Thr Thr Tyr Phe Gly Met Thr Ser Gly Ala Cys Thr Trp Pro Val Ala
 290 295 300
 Ala Ala Glu Thr Thr Glu Gly
 305 310

<210> 17
 <211> 5345
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> pUA4-4 vector

<400> 17

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| gccgtcgccg | tcgcctcctc | ccgcgcggcc | gcctccacgc | agggcatctc | cgaagacctc | 120 |
| tacagccgtt | tagtcgaaat | ggccactatc | tcccaagctg | cctacgccga | cctgtgcaac | 180 |
| attccgtcga | ctattatcaa | gggagagaaa | atttacaatt | ctcaaaactga | cattaacgga | 240 |
| tggatcctcc | gcgacgacag | cagcaaagaa | ataatcaccg | tcttccgtgg | cactggtagt | 300 |
| gatacgaatc | tacaactcga | tactaactac | accctcacgc | ctttcgacac | cctaccacaa | 360 |
| tgcaacgggt | gtgaagtaca | cggtggatat | tatattggat | gggtctccgt | ccaggaccaa | 420 |
| gtcgaagtgc | ttgtcaaaca | gcagggttagc | cagtatccgg | actacgcgct | gaccgtgacc | 480 |
| ggccackccc | tcggcgccctc | cctggcgggca | ctcactgccg | cccagctgtc | tgcgacatac | 540 |
| gacaacatcc | gcctgtacac | cttcggcgaa | ccgcgcagcg | gcaatcaggc | cttcgcgtcg | 600 |
| tacatgaacg | atgccttcca | agcctcgagc | ccagatacga | cgcagtatit | ccgggtcact | 660 |
| catgccaacg | acggcatccc | aaacctgccc | ccggtggagc | aggggtacgc | ccatggcggt | 720 |
| gtagagtact | ggagcgttga | tccttacagc | gcccagaaca | catttgtctg | cactggggat | 780 |
| gaagtgcagt | gctgtgaggc | ccagggcgga | caggggtgtga | ataatgcgca | cacgacttat | 840 |
| tttgggatga | cgagcggagc | ctgtacatgg | tgatcagcta | tttcagcctc | cccagtgta | 900 |
| ccaggaaaga | tggatgtcct | ggagaggggg | ccgcgtaacc | actgaaggat | gagctgtaaa | 960 |
| gaagcagatc | gttcaaacat | ttggcaataa | agtttcttaa | gattgaatcc | tggtgcgggt | 1020 |
| cttgcgatga | ttatcatata | atctctgttg | aattacgtta | agcatgtaat | aattaacatg | 1080 |
| taatgcatga | cgttatttat | gagatgggtt | tttatgatta | gagtcccgc | attatacatt | 1140 |
| taatacgcga | tagaaaacaa | aatatagcgc | gcaaactagg | ataaattatc | gcgcgcgggt | 1200 |
| tcattctatgt | tactagatcg | ataagcttct | agagcggccg | gtggagctcc | aattcgccct | 1260 |
| atagtgaagc | gtattacgcg | cgctcactgg | ccgtcgtttt | acaacgctcg | gactgggaaa | 1320 |
| accctggcgt | tacccaactt | aatcgccctg | cagcacatcc | ccctttcgcc | agctggcgta | 1380 |
| atagcgaaga | ggccgcgacc | gatcgccctt | cccaacagtt | gcgcagcctg | aatggcgaat | 1440 |
| gggacgcgcc | ctgtagcggc | gcattaagcg | cggcgggtgt | ggtggttacg | cgcagcgtga | 1500 |
| ccgctacact | tgccagcgcc | ctagcgcccg | ctcctttcgc | tttcttccct | tcctttctcg | 1560 |
| ccagcttcgc | cggttttccc | cgtaagctc | taaatcgggg | gtcccttcta | gggttccgat | 1620 |
| ttagtgtctt | acggcacctc | gaccccaaaa | aacttgatta | gggtgatggt | tcacgtagt | 1680 |
| ggccatcgcc | ctgatagacg | gtttttcgcc | ctttgacgtt | ggagtccacg | ttctttaata | 1740 |
| gtggactctt | gttccaaact | ggaacaacac | tcaaccttat | ctcgggtctat | tccttttgatt | 1800 |
| tataagggat | tttgccgatt | tcggccctatt | ggttaaaaaa | tgagctgatt | taacaaaaat | 1860 |
| ttaacgcgaa | atattaacgc | ttacaattta | ggtggcactt | gtcgggcaaa | ttcggggaaa | 1920 |
| tgtgcgcgga | acccctatct | gtttatcttt | tcaaatatgt | atccgctcat | atccgctcat | 1980 |
| gagacaataa | ccctgataaa | tgcttcaata | atattgaaaa | aggaagagta | tgagtattca | 2040 |
| acattttccgt | gtcgccctta | ttcccttttt | tgcggcattt | tgcccttccg | tttttgctca | 2100 |
| cccagaaacg | ctggtgaaag | taaaagatgc | tgaagatcag | ttgggtgcac | gagtgggtta | 2160 |
| cactgaactg | gatctcaaca | gcggtaagat | ccttgagagt | tttcgccccg | aagaacgtht | 2220 |
| tccaatgatg | agctacttta | aagttctgct | atgtggcgcg | gtattatccc | gtattgcgac | 2280 |
| cgggcaagag | caactcggtc | gcgcataaca | ctattctcag | aatgacttgg | ttgagtactc | 2340 |
| accagtcaca | gaaaagcatc | ttacgggatg | catgacagta | agagaattat | gcagtgtctg | 2400 |
| cataaccatg | agtgataaca | ctgcggccaa | cttacttctg | acaacgatcg | gaggaccgaa | 2460 |
| ggagctaacc | gctttttttg | acaacatggg | ggatcatgta | actcgccctg | atcgttggga | 2520 |
| accggagctg | aatgaagcca | taccaaacga | cgagcgtgac | accacgatgc | ctgtagcaat | 2580 |
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<221> VARIANT
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Ile Ser Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser
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Gln Ala Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys
  50          55          60
Gly Glu Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu
  65          70          75          80
Arg Asp Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly
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Ser Asp Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe
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Asp Thr Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr

```

| | | |
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| Gln Val Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa | | |
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| Leu Gly Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr | | |
| 165 | 170 | 175 |
| Tyr Asp Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn | | |
| 180 | 185 | 190 |
| Gln Ala Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro | | |
| 195 | 200 | 205 |
| Asp Thr Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly Ile Pro | | |
| 210 | 215 | 220 |
| Asn Leu Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr | | |
| 225 | 230 | 235 |
| Trp Ser Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly | | |
| 245 | 250 | 255 |
| Asp Glu Val Gln Cys Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asn | | |
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<220>
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| gccgtcgccg | tcgcctcctc | ctcctccttc | gccgactcca | accgatccg | gcccgtcacc | 120 |
| gaccgcgcgg | ccgcctccac | gcagggcac | tccgaagacc | tctacagccg | tttagtcgaa | 180 |
| atggccacta | tctcccaagc | tgccacgcgc | gacctgtgca | acattccgtc | gactattatc | 240 |
| aagggagaga | aaattttaca | ttctcaaact | gacattaacg | gatggatcct | ccgcgacgac | 300 |
| agcagcaaa | aaataatcac | cgtcttccgt | ggcactggta | gtgatacgaa | tctacaactc | 360 |
| gatactaact | acaccctcac | gcctttcgac | accctaccac | aatgcaacgg | ttgtgaagta | 420 |
| cacgggtggat | attatattgg | atgggtctcc | gtccaggacc | aagtcgagtc | gcttgtcaaa | 480 |
| cagcagggtta | gccagtatcc | ggactacgcg | ctgaccgtga | ccggccackc | cctcggcgcc | 540 |
| tccttgccgg | cactcaactgc | cgcccagctg | tctgcgacat | acgacaacat | ccgcctgtac | 600 |
| accttcggcg | aaccgcgcag | cgccaatcag | gccttcgcgt | cgtacatgaa | cgatgccttc | 660 |
| caagcctcga | gcccagatac | gacgcagtat | ttccgggtca | ctcatgccaa | cgacggcatc | 720 |
| ccaaacctgc | ccccgggtga | gcagggggtac | gcccattggc | gtgtagagta | ctggagcggt | 780 |
| gataccttaca | gcgcccagaa | cacatttgtc | tgcaactggg | atgaagtgc | gtgctgtgag | 840 |
| gcccaggggcg | gacagggtgt | gaataatgcg | cacacgactt | attttgggat | gacgagcggc | 900 |
| gcatgcacct | ggccgggtgc | ggccgcggaa | ccactgaagg | atgagctgta | aagaagcaga | 960 |
| tcgttcaaac | atttggcaat | aaagtttctt | aagattgaat | cctgttgccg | gtcttgcgat | 1020 |
| gattatcata | taattttctgt | tgaattacgt | taagcatgta | ataattaaca | tgtaatgcac | 1080 |
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| gatagaaaac | aaaatatagc | gcgcaaaacta | ggataaaatta | tcgcgcgcgg | tgatcatctat | 1200 |
| gttactagat | cgataagctt | ctagagcggc | cggtggagct | ccaattcgcc | ctatagttag | 1260 |
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| ttacggcacc | tcgacc'ccaa | aaaacttgat | taggggtgat | gttcacgtag | tgggccatcg | 1680 |
| cctgataga | cgggtttttcg | ccctttgacg | ttggagtcca | cgttctttaa | tagtggactc | 1740 |

| | | | | | | |
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| ttgtttccaaa | ctggaacaac | actcaaccct | atctcgtct | attcttttga | tttataagg | 1800 |
| attttgcga | tttcggccta | ttggttaaaa | aatgagctga | tttaacaaaa | atttaacgcg | 1860 |
| aatttttaaca | aaatattaac | gcttacaatt | taggtggcac | ttttcgggga | aatgtgcgcg | 1920 |
| gaacccctat | ttgtttattt | ttctaaatac | attcaaatat | gtatccgctc | atgagacaa | 1980 |
| aaccctgata | aatgcittcaa | taatatgtga | aaaggaagag | tatgagtatt | caacatttcc | 2040 |
| gtgtcgccct | tattcccttt | ttatcggcat | tttgccttcc | ttgttttgc | caccagaaa | 2100 |
| cgctggtgaa | agtaaaaagat | gctgaagatc | agttgggtgc | acgagtgggt | tacatcgaa | 2160 |
| tgatctcaa | cagcggtaag | atccttgaga | gttttcgccc | cgaagaacgt | tttccaatga | 2220 |
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| cagaaaagca | tcttacggat | ggcatgcag | taaggaatt | gttcagtgtc | gccataacca | 2400 |
| tgagtataaa | cactgcggcc | aacttacttc | tgacaacgat | cggaggaccg | aaggagctaa | 2460 |
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| gtctcgggtg | aacggggggg | tcgtgcacac | agcccgctt | ggagcgaaac | acctacaccg | 3420 |
| aactgagata | cctacagcgt | gagctatgag | aaagcgccac | gcttcccgaa | gggagaaagg | 3480 |
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| ctggcgtctc | cgggcgtgag | tcggccccga | tcctcgcggg | gaatggggct | ctcgcatgta | 5220 |
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[illegible]

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<223> pTT5.14 vector

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| ccgtcaccga | ccgcgcggcc | gcctccacgc | agggcatctc | cgaagacctc | tacagccgtt | 180 |
| tagtcgaat | ggccactatc | tcccacagctg | cctacgccga | cctgtgcaac | attccgtcga | 240 |
| ctattatcaa | gggagagaaa | atttacaatt | ctcaaacgtg | cattaacgga | tggatcctcc | 300 |
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| tttgcgatt | tcggcctatt | ggttaaaaaa | tgagctgatt | taacaaaaat | ttacgcgcaa | 1920 |
| ttttaacaaa | atattaaacg | ttacaattta | gttggcactt | ttcggggaaa | tgtgcgcgga | 1980 |
| acccttattt | gtttattttt | ctaaatacat | tcaaatatgt | atccgctcat | gagacaataa | 2040 |
| ccctgataaa | tgcttcaata | atattgaaaa | aggaagagta | tgagtattca | acattttcgt | 2100 |
| gtcgccctta | ttcccttttt | tgcggcattt | tgccttccgt | tttttgccta | cccagaaaacg | 2160 |
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| agcactttta | aagttctgct | atgtggcgcg | gtattatccc | gtattgacgc | cgggcaagag | 2340 |
| caactcggtc | gcgcataca | ctattctcag | aatgacttgg | ttgagtactc | accagtcaca | 2400 |
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| ggcgtctccg | ggcgtgagtc | ggcccggatc | ctcgcgggga | atggggctct | cggatgtaga | 5280 |
| tcttctttct | ttcttctttt | tgtgttagaa | tttgaatccc | tcagcatgtt | tcacgcgtag | 5340 |
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| Ala | Ala | Val | Ala | Val | Ala | Ser | Ser | Ser | Ser | Phe | Ala | Asp | Ser | Asn | Pro | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Gly | Arg | Pro | Val | Thr | Asp | Arg | Ala | Ala | Ala | Ser | Thr | Gln | Gly | Ile | Ser | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Glu | Asp | Leu | Tyr | Ser | Arg | Leu | Val | Glu | Met | Ala | Thr | Ile | Ser | Gln | Ala | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| Ala | Tyr | Ala | Asp | Leu | Cys | Asn | Ile | Pro | Ser | Thr | Ile | Ile | Lys | Gly | Glu | |
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| Lys | Ile | Tyr | Asn | Ser | Gln | Thr | Asp | Ile | Asn | Gly | Trp | Ile | Leu | Arg | Asp | |
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 Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr
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 Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
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 Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
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 Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
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 Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
 180 185 190
 Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
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 Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr
 210 215 220
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 225 230 235 240
 Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
 245 250 255
 Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu
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<213> Artificial Sequence

<220>

<223> pTP8-5 vector

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| gaccgcgcgg | ccgcctccac | gcagggcate | tcggaagacc | tctacagccg | tttagtcgaa | 180 |
| atggccacta | tctcccaagc | tgcctacgcc | gacctgtgca | acattccgtc | gactattatc | 240 |
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| agcagcaaag | aaataatcac | cgtcttccgt | ggcactggta | gtgatacgaa | tctacaactc | 360 |
| gatactaact | acaccctcac | gcctttcgac | accctaccac | aatgcaacgg | ttgtgaagta | 420 |
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| gaacccttat | ttgtttatth | ttctaaatac | attcaaatat | gtatccgctc | atgagacaat | 1980 |
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[illegible]

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| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| Gly | His | Ala | Leu | Ala | Ala | Ser | Thr | Gln | Gly | Ile | Ser | Glu | Asp | Leu | Tyr | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Ser | Arg | Leu | Val | Glu | Met | Ala | Thr | Ile | Ser | Gln | Ala | Ala | Tyr | Ala | Asp | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Leu | Cys | Asn | Ile | Pro | Ser | Thr | Ile | Ile | Lys | Gly | Glu | Lys | Ile | Tyr | Asn | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
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[illegible]

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| ccagggttgt | gaagtacacg | gtggatatatta | tatttgatgg | gtctccgtcc | aggaccaagt | | 180 |
| cgagtcgctt | gtcaaacacg | aggttagcca | gtatccggac | tacgcgctga | ccgtgaccgg | | 240 |
| ccackccctc | ggcgccctcc | tggcggcact | cactgccgcc | cagctgtctg | cgacatacga | | 300 |
| caacatccgc | ctgtacacct | tgcgcgaacc | gcgcagcggc | aatcaggcct | tcgcgtcgta | | 360 |
| catgaacgat | gccttccaag | cctcgagccc | agatacgacg | cagtattttc | gggtcactca | | 420 |
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| tccaactgga | tctcaacagc | ggtaagatcc | ttgagagttt | tgcgcccgaa | gaacgttttc | 1980 |
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 35 40 45
 Tyr Tyr Ile Gly Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val
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 Lys Gln Gln Val Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly
 65 70 75 80
 His Xaa Leu Gly Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser
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 Ala Thr Tyr Asp Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser
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 Gly Asn Gln Ala Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser
 115 120 125
 Ser Pro Asp Thr Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly
 130 135 140
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 Glu Tyr Trp Ser Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys
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| | | | 100 | | | | | 105 | | | | | 110 | | |
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| tagaatttga | atccctcagc | attgttcctc | ggtagttttt | cttttcatga | tttgtgacaa | 4740 |
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<220>

<223> pJQ5 vector

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| ctagatagca | cagccacagc | acctacagga | gtgcgacact | tgtggactgt | agtagtggtg | 180 |
| gagacggagc | tcttttctac | ctcctgacgt | tgccgcggtt | gtccattcca | acggcatcac | 240 |
| tctcaaccaa | tcacgcgctc | ccaacaaaat | atcgtccccc | atgtcttggt | ggagagagag | 300 |
| tacatacatg | ctgtcgcgcc | gtttttgtct | gaatctcgct | tccactggcc | aatcagctca | 360 |
| gctcccggga | gctcactcat | tcaagatccc | atcgtcgctg | tcacccctgg | cgtcattgga | 420 |
| tggaaaagaa | cctccgttgc | tcggatgagt | cagccatata | cccgaacaga | gtactgcaag | 480 |
| ataacccaat | tcagattccc | ccaatagaga | aagtatagca | tgttttcggg | ttttgttttg | 540 |
| cttaattgac | tttatttttt | ttggagttga | atgctgattt | gttgtgtaaa | atgcccaacc | 600 |
| atctgaatat | cgagacggat | aataggctgg | ctaattaatt | tatagcaaga | ttctgtagtg | 660 |
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| gggacgcgag | ctcccgctca | ccagtaacct | ctcgcctcgc | tccccctgcc | ggacgaccca | 840 |
| gtaaaatact | gttgcccact | cgccggcgag | atggmctgtc | acaaggaggt | saacttcgts | 900 |
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| | | | | | | |
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| caagctgcct | acgccgacct | gtgcaacatt | cgtcgacta | ttatcaagg | agagaaaatt | 1140 |
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| ttcttaagat | tgaactcctg | tgcgcgtctt | gcgatgatta | tcatataatt | tctgttgaat | 1980 |
| tactgtaagc | atgtaataat | taactatgaa | tgcattgacg | tatttatgag | atgggttttt | 2040 |
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| cacatcccc | tttcgccagc | tggcgtaata | gcgaagaggc | ccgcacgat | cgcccttccc | 2340 |
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| agcagcaaa | aaataatcac | cgtcttccgt | ggcactggta | gtgatacgaa | tctacaactc | 360 |
| gatactaact | acacctcac | gcctttcgac | acctaccac | aatgcaacgg | ttgtgaagta | 420 |
| cacggtggat | atttatattg | atgggtctcc | gtccaggacc | aagtcgagtc | gcttgtcaaa | 480 |
| cagcaggtta | gccagtatcc | ggactacgcg | ctgaccgtga | ccggccackc | cctcggcgcc | 540 |
| tccttgccgg | cactcactgc | cgcccagctg | tctgcgacat | acgacaacat | ccgcctgtac | 600 |
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| gattttgccg | atttcggcct | attgggttaa | aatgagctg | atttaacaaa | aatttaacgc | 1860 |
| gaattttaac | aaaatatata | cgcttacaat | ttagggtgca | cttttcgggg | aatgtgcgc | 1920 |
| ggaaccccta | tttgtttatt | tttctaaata | cattcaata | tgtatccgct | catgagacaa | 1980 |
| taaccctgat | aaatgcttca | ataatattga | aaaagggaag | gtatgagtat | tcaacatttc | 2040 |
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| | | | | | | |
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| agccgtagtt | aggccaccac | ttcaagaact | ctgtagcacc | gcctacatac | ctcgctctgc | 4140 |
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| tgttgtgtgg | aattgtgagc | ggataacaat | ttcacacagg | aaacagctat | gaccatgatt | 4920 |
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<212> DNA

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| tacagccgtt | tagtcgaaat | ggccactatc | tcccaagctg | cctacgccga | cctgtgcaac | 180 |
| attccgtcga | ctattatcaa | gggagagaaa | atttacaatt | ctcaaactga | cattaacgga | 240 |
| tggatcctcc | gcgacgacag | cagcaaaaga | ataatcaccg | tcttcctggt | cactggtagt | 300 |
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<221> misc feature

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<223> n = A,T,C or G

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| cggcccgctc | ccgagcgcgc | ggccgcctcc | acgcagggca | tctccgaaga | cctctacagc | 1020 |
| cgtttagtgc | aaatggccac | tatctcccaa | gctgcctacg | ccgacctgtg | caacattccg | 1080 |
| tcgactatta | tcaagggaga | gaaaatttac | aattctcaaa | ctgacattaa | cgatggatc | 1140 |
| ctccgcgacg | acagcagcaa | agaaataate | accgtcttcc | gtggcactgg | tagtgatacg | 1200 |
| aatctacaac | tcgatactaa | ctacaccctc | acgcctttcg | acaccctacc | acaatgcaac | 1260 |
| ggttgtgaag | tacacggtgg | atattatatt | ggatgggtct | ccgtccagga | ccaagtgcag | 1320 |
| tcgcttgtca | aacagcaggt | tagccagtat | ccggactacg | cgctgaccgt | gaccggccac | 1380 |
| keccctcgcg | cctccctggc | ggcactcact | gcccgcacgc | tgtctgcgac | atacgacaac | 1440 |
| atccgcctgt | acaccttcgg | cgaaccgcgc | agcggcaatc | aggccttcgc | gtcgtacatg | 1500 |
| aacgatgcct | tccaagcctc | gagcccagat | acgacgcagt | atttcgggtg | cactcatgcc | 1560 |
| aacgacggca | tcccaaacct | gcccccggtg | gagcaggggt | acgcccattg | cggtgtagag | 1620 |
| tactggagcg | ttgatactta | cagcgcgccg | aacacatttg | tctgcactgg | ggatgaagt | 1680 |
| cagtgtgtgt | aggcccaggg | cggacagggg | gtgaataatg | cgcacacgac | ttattttggg | 1740 |
| atgacgagcg | gagcctgtac | atggtgatca | gtcatttcag | cctccccgag | tgtaccagga | 1800 |
| aagatggatg | tcctggagag | ggggcccgct | aaccactgaa | ggatgagctg | taaagaagca | 1860 |
| gatcgttcaa | gtatttggca | ataaagtttc | ttaagattga | atcctgttgc | cggtcttgcg | 1920 |
| atgattatca | tataatttct | gttgaattac | gttaagcatg | taataattaa | catgtaatgc | 1980 |
| atgacgttat | ttatgagatg | ggtttttatg | attagagtcc | cgcaattata | catttaatac | 2040 |
| gcgatagaaa | acaaaatata | gcgcgcacac | taggataaat | tatcgcgcgc | ggtgtcatct | 2100 |
| atgttactag | atcgataagc | ttctagagcg | gcccgtggag | ctccaattcg | ccctatagt | 2160 |
| agtcgtatta | cgcgcgctca | ctggccgctg | ttttacaacg | tcgtgactgg | gaaaaccctg | 2220 |
| gcgttaccca | acttaatcgc | cttgacgac | atcccccttt | cgcacgctgg | cgtaatagcg | 2280 |
| aagaggcccg | caccgatcgc | ccttcccaac | agttgcgcag | cctgaatggc | gaatgggacg | 2340 |
| cgccctgtag | cggcgcatta | agcgcggcgg | gtgtgggtgg | tacgcgcagc | gtgaccgcta | 2400 |
| cacttgccag | cgccttagcg | cccgtcctt | tcgctttctt | cccttccttt | ctcgcacagt | 2460 |
| tcgcccgtct | tccccgtcaa | gctctaaatc | gggggctccc | tttagggttc | cgatttagtg | 2520 |
| ctttacggca | cctcgacccc | aaaaaacttg | attaggggtga | tggttcacgt | agtgggccat | 2580 |
| cgccctgata | gacggtgttt | cgccttttga | cgttggagtc | cacgttcttt | aatagtggac | 2640 |
| tcttgttcca | aactggaaca | acactcaacc | ctatctcggt | ctattctttt | gatttataag | 2700 |
| ggattttgcc | gatttcggcc | tattgggttaa | aaaatgagct | gatttaacaa | aaatttaacg | 2760 |
| cgaattttta | caaaatatta | acgtttacaa | tttaggtggc | acttttcggg | gaaatgtgcg | 2820 |
| cggaaacccct | atttgtttat | ttttctaaat | acattcaaat | atgtatccgc | tcattgagaca | 2880 |
| ataaccctga | taaatgcttc | aataatattg | aaaaaggaag | agtatgagta | ttcaacattt | 2940 |
| ccgtgtcgcc | cttattccct | tttttgccgc | attttgcctt | cctgtttttg | ctcaccagga | 3000 |
| aacgctgggt | aaagtaaaag | atgctgaaga | tcagttgggt | gcacgagtg | gttacatcga | 3060 |
| actggatctc | aacagcggta | agatccttga | gagttttcgc | cccgaagaac | gttttccaat | 3120 |
| gatgagcact | tttaaagttc | tgctatgtgg | cgcggtatta | tcccgtattg | acgcggggca | 3180 |

| | | | | | | |
|-------------|------------|-------------|-------------|-------------|-------------|------|
| agagcaactc | ggtcgccgca | tacactattc | tcagaatgac | ttggttgagt | actcaccagt | 3240 |
| cacagaaaag | catcttacgg | atggcatgac | agtaagagaa | ttatgcagtg | ctgccataac | 3300 |
| catgagtgat | aacactgcgg | ccaacttact | tctgacaacg | atcggaggac | cgaaggagct | 3360 |
| aaccgctttt | ttgcacaaca | tgggggatca | tgtaaactcg | cttgatcggt | gggaaccgga | 3420 |
| gctgaatgaa | gccataccaa | acgacgagcg | tgacaccacg | atgctgtgag | caatggcaac | 3480 |
| aacgttgcgc | aaactattaa | ctggcgaaact | acttactcta | gcttcccgcg | aacaattaat | 3540 |
| agactggatg | gaggcgata | aagttgcagg | accactttctg | cgctcgcccc | ttccggctgg | 3600 |
| ctggtttatt | gctgataaat | ctggagccgg | tgagcgtggg | tctcgcggt | tcattgcagc | 3660 |
| actggggcca | gatggtaagc | cctcccgat | cgtagtatat | tacacgacgg | ggagtcaggc | 3720 |
| aactatggat | gaacgaata | gacagatcgc | tgagataggt | gcctactga | ttaaagcattg | 3780 |
| gtaactgtca | gaccaagttt | atctatatat | actttagatt | gatttaaaac | ttcatttttta | 3840 |
| atttaaaagg | atctaggtga | agatcctttt | tgataatctc | atgacaaaa | ttcccttaacg | 3900 |
| tgagtttttcg | ttccactgag | cgtcagaccc | cgtagaaaag | atcaaaggat | cttcttgaga | 3960 |
| tcctttttttt | ctgcgcgtaa | tctgctgctt | gcaaaaaaaa | aaaccaccgc | taccagcggt | 4020 |
| ggtttgtttg | cggagtcaag | agctaccaac | tctttttccg | aaggttaactg | gcttcagcag | 4080 |
| agcgcgata | ccaaatactg | tccttctagt | gtagccgtag | ttaggccacc | acttcaagaa | 4140 |
| ctctgtagca | ccgcctacat | acctcgctct | gctaatcctg | ttaccagtg | ctgctgccag | 4200 |
| tggcgataag | tcgtgtctta | ccgggttgga | ctcaagacga | tagttaccgg | ataaggcgca | 4260 |
| gcggtcgggc | tgaacggggg | gttcgtgcac | acagcccgag | ttggagcgaa | cgacctcac | 4320 |
| cgaaactgaga | tacctacagc | gtgagctatg | agaaaagcgc | acgcttcccg | aagggagaaa | 4380 |
| ggcgcgacag | tatccggtaa | gcggcagggt | cggaaacagga | gagcgcacga | gggagcttcc | 4440 |
| agggggaaac | gcctggtatc | tttatagtc | tgtcgggttt | cgccacctct | gacttgagcg | 4500 |
| tcgatttttg | tgatgctcgt | cagggggcg | gagcctatgg | aaaaacgcca | gcaacgcggc | 4560 |
| ctttttacgg | ttcctggcct | tttgctggcc | ttttgtctac | atgtttcttt | ctcgcttatc | 4620 |
| ccctgattct | gtggataacc | gtattaccgc | ctttgaatga | gctgtataccg | ctgcgcgcag | 4680 |
| cagaacgacc | gagcgcagcg | agtcagtga | cgaggaaagc | gaagagcgcc | caatacgcaa | 4740 |
| accgcctctc | ccgcgcggtt | ggccgattca | ttaatgcagc | tggcacgaca | ggtttccgga | 4800 |
| ctggaaagcg | ggcagtgagc | gcaacgcaat | taatgtgagt | tagctcactc | attaggcacc | 4860 |
| ccaggtctta | cactttatgc | ttccggctcg | tatgttgtgt | ggaatttgtga | gcggataaca | 4920 |
| atttcacaca | ggaacatgat | atgaccatga | ttacgcgaag | cgcgcaatta | accctacta | 4980 |
| aaqqqaacaa | aaqctgggta | c | | | | 5001 |

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<210> 41
<211> 5387
<212> DNA
<213> Artificial Sequence
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<220>
<223> pTP11-1 vector

[illegible]

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| aaaatatagc | gcgcaaaacta | ggataaatta | tgcgcgcg | tgatcatctat | gttactagat | 1260 |
| cgataagctt | ctagagcggc | cggtggagct | ccaattcgcc | ctatagtgag | tcgtattacg | 1320 |
| cgcgctcact | ggcgcgcgtt | ttacaacgct | gtgactggga | aaaccctggc | gttaccacaac | 1380 |
| ttaatcgcc | tgcagcacat | cccccttctg | ccagctggcg | taatagcgaa | gagggcccgca | 1440 |
| ccgatcgccc | ttcccaacag | ttgcgcagcc | tgaatggcga | atgggacgcg | ccctgtagcg | 1500 |
| gcgcattaag | cgcggcgggg | gtggtggtta | cgcgcagcgt | gaccgctaca | cttgccagcg | 1560 |
| ccctagcgcc | cgtcccttct | gctttcttcc | cttcctttct | cgccacgttc | gccggctttc | 1620 |
| cccgctcaagc | tctaaatcgg | gggctccctt | taggggttccg | atttagtgct | ttacggcacc | 1680 |
| tcgaccccaa | aaaacttgat | taggggtgatg | gttcacgtag | tgggccatcg | ccctgataga | 1740 |
| cggtttttctg | ccctttgacg | ttggagtcca | cgttctttaa | tagtggactc | ttgttccaaa | 1800 |
| ctggaacaac | actcaaccct | atctcgggtct | attcttttga | tttataaggg | attttgcccga | 1860 |
| tttcggccta | ttgggttaaaa | aatgagctga | tttaacaaaa | atttaacgcg | aattttaaca | 1920 |
| aaatattaac | gcttacaatt | taggtggcac | ttttcgggga | aatgtgcgcg | gaacccttat | 1980 |
| ttgttttatt | ttctaaatac | attcaaatat | gtatccgctc | atgagacaat | aaccctgata | 2040 |
| aatgctttcaa | taattattgaa | aaaggaagag | tatgagtatt | caacattttcc | gtgtcgccct | 2100 |
| tattcccttt | tttgccggt | tttgccctcc | tgtttttgct | caccagaaaa | cgctggtaga | 2160 |
| agtaaaagat | gctgaagatc | agttgggtgc | acgagtgggt | tacatcgaa | tggatctcaa | 2220 |
| cagcggttaag | atccttgaga | gttttcgccc | cgaagaacgt | tttccaatga | tgagcacttt | 2280 |
| taaagttctg | ctatgtggcg | cggtattatc | ccgtattgac | gccgggcaag | agcaactcgg | 2340 |
| tcgcccata | cactattctc | agaatgactt | ggttgagtac | tcaccagtca | cagaaaagca | 2400 |
| tcttacggat | ggcatgacag | taagagaatt | atgcagtgtc | gccataacca | tgagtataaa | 2460 |
| cactgcggcc | aacttacttc | tgacaacgat | cggaggaccg | aaggagctaa | ccgctttttt | 2520 |
| gcacaacatg | ggggatcatg | taactcgctt | tgatcgttgg | gaaccggagc | tgaatgaagc | 2580 |
| cataccaaac | gacgagcgtg | acaccacgat | gcctgtagca | atggcaacaa | cgttgcgcaa | 2640 |
| actattaact | ggcgaaactac | ttactctagc | ttcccggcaa | caattaatat | actggatgga | 2700 |
| ggcgataaaa | gttgccaggac | cacttctgct | ctcgccctt | ccggttggtc | ggtttattgc | 2760 |
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| tggtaaagccc | tcccgtatcg | tagttatcta | cacgacgggg | agtcaggcaa | ctatggatga | 2880 |
| acgaaataga | cagatcgctg | agataggtgc | ctcactgatt | aagcattggg | aactgtcaga | 2940 |
| ccaagtttac | tcatatatac | tttagattga | tttaaaactt | catttttaaat | ttaaaaggat | 3000 |
| ctaggtgaag | atcctttttt | ataatctcat | gacccaaaac | ccttaacgtg | agttttcgtt | 3060 |
| ccactgagcg | tcagacccc | tagaaaagat | caaaggatct | tcttgagatc | ctttttttct | 3120 |
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| ggatcaagag | ctaccaactc | tttttccgaa | ggtaactggc | ttcagcagag | cgcagatacc | 3240 |
| aaatactgtc | cttctagtgt | agccgtagtt | aggccaccac | ttcaagaact | ctgtagcacc | 3300 |
| gcctacatac | ctcgtctctg | taatcctggt | accagtggct | gctgccagtg | gcgataagtc | 3360 |
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| aacggggggg | tcgtgcacac | agcccagctt | ggagcgcga | acctacaccg | aactgagata | 3480 |
| cctacagcgt | gagctatgag | aaagcgccac | gcttcccga | gggagaaagg | cggacaggta | 3540 |
| tcgggtaagc | ggcagggctg | gaacaggaga | gcgcacgagg | gagcttccag | ggggaaacgc | 3600 |
| ctggtatctt | tatagtcctg | tcgggtttct | ccacctctga | cttgagcgtc | gattttttgt | 3660 |
| atgctcgtca | ggggggcgga | gcctatggaa | aaacgccagc | aacgcggcct | ttttacggtt | 3720 |
| cctggccttt | tgctggcctt | ttgctcacat | gttcttttct | gcgttatccc | ctgattctgt | 3780 |
| ggataaccgt | attaccgcct | ttgagtgagc | tgataccgct | cgcgcgagcc | gaacgaccga | 3840 |
| gcgcagcgag | tcagtgagcg | aggaagcgga | agagcgccca | atacgcaaac | cgcctctccc | 3900 |
| cgcgcgttgg | ccgattcatt | aatgcagctg | gcacgacagg | tttcccgaact | ggaaagcggg | 3960 |
| cagtgcgcgc | aacgcaatta | atgtgagtta | gctcactcat | taggcacccc | aggctttaca | 4020 |
| ctttatgctt | ccggctcgta | tgttgtgtgg | aattgtgagc | ggataacaat | ttcacacagg | 4080 |
| aaacagctat | gaccatgatt | acgccaaagc | cgcaattaac | cctcactaaa | gggaacaaaa | 4140 |
| gctgggtacc | gggccccccc | tcgaggtcat | tcatatgctt | gagaagagag | tcgggatagt | 4200 |
| ccaaaataaa | acaaaggtaa | gattacctgg | tcaaaagtga | aaacatcagt | taaaagggtg | 4260 |
| tataagtaaa | atatcggtaa | taaaagggtg | cccaaagtga | aattttactct | tttctactat | 4320 |
| tataaaaaatt | gaggatgttt | tgctcggtact | ttgatacgtc | atttttgtat | gaattgggtt | 4380 |
| ttaagtttat | tcgcgatttg | gaaatgcata | tctgtatttg | agtcgggttt | taagttcggt | 4440 |
| gcttttctaa | atacagaggg | atttgtataa | gaaatatctt | taaaaaaccc | atatgctaata | 4500 |
| ttgacataat | ttttgagaaa | aatatatatt | caggcgaatt | ccacaatgaa | caataaataag | 4560 |
| attaaaaatag | cttgcccccg | ttgcagcgat | gggtattttt | tctagtataaa | taaaagataa | 4620 |
| acttagactc | aaaacattta | caaaaacaac | ccctaaagtc | ctaaagccca | aagtgcatag | 4680 |
| cacgatccat | agcaagccca | gcccaaccca | acccaaccca | acccaaccca | gtgcagccaa | 4740 |

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<220>
<223> pTP11-1 vector

<221> VARIANT
<222> (1)...(301)
<223> Xaa = Any Amino Acid
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42

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 290 295 300

<210> 43
 <211> 1259
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> actin promoter

<400> 43
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 aaaattgagg atgtttttgtc ggtactttga tacgtcattt ttgtatgaat tgggtttttaa 240
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 ttgtaaatac agaggggattt gtataagaaa tatcttttaa aaacccatat gctaatttga 360
 cataattttt gagaaaaata tatattcagg cgaattccac aatgaacaat aataagatta 420
 aaatagcttg cccccgttgc agcgatgggt attttttcta gtaaaataaa agataaaactt 480
 agactcaaaa catttacaaa aacaacccct aaagtccata agcccaaagt gctatgcacg 540
 atccatagca agcccagccc aacccaaccc aacccaaccc accccagtgc agccaactgg 600
 caaatagtct ccacccccgg cactatcacc gtgagttgtc cgcaccaccg cacgtctcgc 660
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 cgtggggggc ggaaaagcga ggaggatcgc gagcagcgac gagggccggc cctccctcgc 780
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 cttctttttg tggtagaatt tgaatccctc agcattgttc atcggtagtt tttcttttca 1200
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<210> 44
 <211> 27
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> aleurain-NPIR delete structure

<400> 44
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 1 5 10 15
 Ala Ala Val Ala Val Ala Ser Ser Arg Ala Ala
 20 25

<210> 45
 <211> 93
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> aleurain-NPIR delete structure encoding sequence

<400> 45
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 gccgtcgccg tcgcctcttc ccgcgcggcc gcc 93

| | | | | | | |
|------------|------------|------------|------------|-------------|------------|-----|
| gagacggagc | tctttcctac | ctcctgacgt | tgcgcgcgtt | gtccattcca | acggcatcac | 240 |
| tctcaaccaa | tcacgcgctc | ccaacaaaat | atcgcccccc | atgtcttggc | ggagagagag | 300 |
| tacatacatg | ctgtcgcgcc | gtttttgtct | gaatctcgct | tccactggcc | aatcagctca | 360 |
| gctcccggga | gctcactcat | tcaagatccc | atcgtcgtcg | tcacccctgg | cgtcattgga | 420 |
| tggaaaagaa | cctccgtttg | tcggatgagt | cagccatatc | cccgaacaga | gtactgcaag | 480 |
| ataacccaat | tcagattccc | ccaatagaga | aagtatatga | tgccttcggg | ttttgtttgg | 540 |
| cttaattgac | ttttattttg | ttggagttga | atgctgattt | gtttgtgtaa | atgcccaacc | 600 |
| atctgaatat | cgagacggat | aataggctgg | ctaattaatt | tatagcaaga | ttctgtagtg | 660 |
| cacatcgcaa | atatctttct | gggcattaca | gctggaggct | tcatcagcct | gaaacactct | 720 |
| gcagagcctg | aagcaagtgg | tgaagcgtgg | cgatgagatg | ggtataaaaac | ccccggcacc | 780 |
| gggacgcgag | ctcccgccct | ccagtaacct | ctgcctcgcg | tccccctgce | ggacgaccca | 840 |
| gtaaaatact | gttgcccact | cgcgcgcgag | atggcccacg | cgcgcatcct | ctctctggcg | 900 |
| ctcgcgctgt | tggccaccgc | cgcggtggcc | gccgcactct | tggcggactc | caacccgatc | 960 |
| cggcccgcca | cggagcgcgc | ggccgcc | | | | 987 |

<210> 49

<211> 40

<212> DNA

<213> Artificial Sequence

 $\langle 220 \rangle$

<223> primer

<400> 49

ggcgccgagg gagtggccgg tcacggtcag cgcgtagtcc

40

<210> 50

<211> 35

<212> DNA

<213> Artificial Sequence

 $\langle 220 \rangle$

<223> primer

<400> 50

ccggccaacgc cctcgggcgcc tccttggcgg cactc

35

<210> 51

<211> 44

<212> DNA

<213> Artificial Sequence

<220>

<223> primer

<400> 51

ctaaagctta ccatggcggc cgctccacg cagggcatct ccga

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<210> 52

<211> 50

<212> DNA

<213> Artificial Sequence

 $\langle 220 \rangle$

<223> primer

<400> 52

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50

<210> 53

<211> 325
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> amplified nos terminator sequence from pMA406
 vector

<400> 53
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 tatcatataa tttctgttga attacgttaa gcatgtaata attaacatgt aatgcatgac 180
 gttatttatg agatggggtt ttatgattag agtcccgcga ttatacattt aatacgcgat 240
 agaaaacaaa atatagcgcg caaactagga taaattatcg cgcgcggtgt catctatggt 300
 actagatcga taagcttcta gatct 325

<210> 54
 <211> 72
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 54
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 ttcaaacatt tg 72

<210> 55
 <211> 20
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> primer

<400> 55
 aagactgcag accatggcgg 20

<210> 56
 <211> 40
 <212> DNA
 <213> Artificial Sequence

<220>
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<400> 56
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<210> 57
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<220>
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<400> 57
 ctaggcggcc gcgcgggagg aggcgacggc gac 33

<210> 58
 <211> 36
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 <220>
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 <400> 58
 gaggtgtat tcggtatcga gttgcagggt cgtatc 36

 <210> 59
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 <220>
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 <400> 59
 ctcgataccc attacaccct cagcctttc ga 32

 <210> 60
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 <400> 60
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 <210> 61
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 <223> synthetic oligonucleotide

 <400> 61
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 <210> 62
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 <220>
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 <400> 62
 aaccatggcg gccgcgcgct cggtagcggg ccggat 36

 <210> 63
 <211> 29
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<220>
 <223> primer

<400> 63
 ttcggtacca tggccaggta taattatgg 29

<210> 64
 <211> 31
 <212> DNA
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<220>
 <223> primer

<400> 64
 ctgcgcgcgc gagatggmcg tgcacaagga g 31

<210> 65
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 <212> DNA
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<220>
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<400> 65
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<210> 66
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<220>
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<400> 66
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<210> 67
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<220>
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<400> 67
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<400> 68

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<400> 69
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<210> 70
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<400> 70
 actaagctta aggagatata acaatgatcc acaccaacct caa 43

<210> 71
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<400> 71
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<210> 72
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<400> 72
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<220>
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<400> 73
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<210> 74
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<220>
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<400> 74
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<220>
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<400> 75
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<400> 76
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<210> 77
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<220>
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<400> 77
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<210> 78
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<220>
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<400> 78
 gatcaggagg taggcwacga agttwacctc cttgtgc 37

<210> 79
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<213> Artificial Sequence

<220>

<223> KDEL fusion peptide

<400> 85

Lys Pro Leu Lys Asp Glu Leu
1 5

<210> 86

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> designated KDEL fusion peptide

<400> 86

Glu Pro Leu Lys Asp Glu Leu
1 5

<210> 87

<211> 5

<212> PRT

<213> Artificial Sequence

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<223> frameshifted terminal peptide

<400> 87

Glu Thr Thr Glu Gly
1 5

<210> 88

<211> 27

<212> PRT

<213> Aspergillus niger

<400> 88

Met Lys Gln Phe Ser Ala Lys His Val Leu Ala Val Val Val Thr Ala
1 5 10 15
Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile
20 25

<210> 89

<211> 9

<212> PRT

<213> Aspergillus niger

<400> 89

Met Ala Ala Ala Ser Thr Gln Gly Ile
1 5

<210> 90

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> ER retention vector

<400> 90
Lys Pro Leu Lys Asp Glu Leu
1 5

<210> 91
<211> 5
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<220>
<223> c-terminal targeting sequence

<400> 91
Pro Val Ala Ala Ala
1 5

<210> 92
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<212> DNA
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<220>
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<400> 92
tatccatggc ggccgcgcgg tcggtgacgg gccggccccg gttggagtcg gcgaa 55

<210> 93
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> ferulic esterase end

<400> 93
Cys Thr Trp Pro Val Ala Ala Ala
1 5

<210> 94
<211> 72
<212> PRT
<213> Artificial Sequence

<220>
<223> pTP4a2 vector

<400> 94
Met Lys Gln Phe Ser Ala Lys His Val Leu Ala Val Val Val Thr Ala
1 5 10 15
Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile Ser Glu Asp Leu Tyr
20 25 30
Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala Ala Tyr Ala Asp
35 40 45
Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile Tyr Asn
50 55 60
Ser Gln Thr Asp Ile Asn Gly Trp
65 70

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<400> 95
Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser Leu Ala Ala
 1             5             10            15
Leu
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<210> 96
<211> 17
<212> PRT
<213> Artificial Sequence
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<400> 96
Tyr Ala Leu Thr Val Thr Gly His Ala Leu Gly Ala Ser Leu Ala Ala
  1                      5                      10                     15
Leu
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<210> 97
<211> 4
<212> PRT
<213> Artificial Sequence
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<400> 97
Lys Asp Glu Leu
1